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Australian
Learning
Lecture

**JOY AND DATA:
CREATING SUCCESS
FOR EVERY STUDENT**



AUSTRALIAN LEARNING LECTURE

The Australian Learning Lecture (ALL) is a joint project of State Library Victoria and the Koshland Innovation Fund. Commencing in 2015, the decade-long project is designed to strengthen the importance of learning in Australia for all Australians. It is not politically or commercially aligned.

ALL is structured around a biennial lecture that brings to national attention a new, big idea in learning and compelling reasons for new approaches to learning. The lecture is followed by a two-year impact program to showcase how the idea proposed in the lecture can be translated into practice and to create awareness of the need for a learning culture in Australia.

OUR IMPACT PROGRAM

Our impact program is designed to show that big ideas are possible in practice, to create awareness of the need for a learning culture and to build engagement with learning.

ALL is developing and distributing evidence-based, data-driven resources that tackle issues where Australia is doing poorly and what many Australian students struggle with – low literacy and numeracy understanding, well-being, building critical skills and problem solving.

The **ALL Case Studies** are practical examples of how joy and data can come together in learning. Inspired by the inaugural Australian Learning Lecture, delivered by Sir Michael Barber, the ALL Case Studies examine how data gathered through the use of diagnostic tools in real learning experiences provides greater insight into how each student learns. Data enables educators to help learners find joy in learning, to flourish and tackle life's opportunities.

Find out more about the Australian Learning Lecture at www.all-learning.org.au.

WATCH THE VIDEOS

The video of Sir Michael Barber's Lecture, *Joy and Data*, and case study videos of six exemplar schools showing how they use data and diagnostic tools are available at www.all-learning.org.au.

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“Data, far from being in opposition to joy, is an important ingredient in it.”

Sir Michael Barber, Australian Learning Lecture, 21 May 2015,
www.all-learning.org.au.

INTRODUCTION

State Library Victoria is committed to creating enriching experiences for young learners and their families, carers and teachers. Our partnership with the Australian Learning Lecture is an avenue for pursuing this commitment, as part of our vision of being a library for all in a changing world. With a focus on learning, and the rich possibilities which exploration, imagination and creativity create, the theme of the inaugural Lecture, *Joy and Data*, goes to the core of our interest in the power of knowledge to change lives.

For over 160 years our wonderful library has encouraged life-long learning and our spaces and programs have inspired so many Victorians and visitors in the pursuit of knowledge. So, we are very proud to be partnering with the Australian Learning Lecture in this publication.

In our broad range of learning programs offered at State Library Victoria we endeavour to engage young people in critical thinking through the development of research skills. Our writer development program fosters literacy and communication skills, supporting best-practice in writing both for, and by young people. We also offer programs which build the capacity of teachers and adults to support young Australians' educational development.

Our partnership with Koshland Innovation Fund, the Australian Learning Lecture, is designed to strengthen the importance of learning in Australia for all Australians. I invite readers to delve into the possibilities that good data and diagnostic tools can create for all learners.



Kate Torney
CEO, State Library Victoria

FOREWORD

Education in Australia has increasingly become a highly-pressurised pursuit of success. More than ever, students are told to excel academically if they are going to succeed in life. Are we at risk of losing all joy of learning?

Sometimes success can be driven by joy as well as by effort. Today, however, too many students achieve academic success without any joy at all, while others underachieve, never having known the joy of discovery, contribution, or deep connection.

At the same time, when we think about data in education it usually has negative associations. This is because data is used to highlight inefficiencies and perceived lack of progress. But data can be exciting, and most of all it can be enabling.

The ten-year Australian Learning Lecture (ALL) series began with the theme of *Joy and Data* delivered by Sir Michael Barber, the distinguished British thought leader. The inaugural lecture looked at the rarely explored intersection between the joy of learning and the way in which we use data to measure, value and enable success.

Linking joy and data is a bold idea as they are normally seen as opposites. However, as Sir Michael argues in his lecture, if, instead of judgement, data can be used to enable us to understand where the problems are and inform the way we address them, it can serve an invaluable positive role.

To date, the discussion of data in Australia has centred on standardised exams held yearly. But, as we know, tests provide only one kind of data. Data gathered through using diagnostic tools, both adaptive and predictive, provides greater insight into how each student learns. It allows us to know the progression of each student, what works for them, where they are and where they need to go.


Over the past two years, the Australian Learning Lecture has identified many examples of how in Australia, schools are using many exciting new diagnostic tools and methods of measuring success.

This publication of Sir Michael's speech, together with six exemplars, highlights just some of the diverse ways of thinking about and using data to ensure each student is successful, confident and ready for the future.

While each case study focuses on different aspects of learning there are common themes threaded through each:

- Each case study provides an encouraging example of how schools are using analytics (both adaptive and predictive) to understand learning processes and tailor education to students' individual needs.
- Data offers so much in the way of optimising a school and the moving parts that come with school experience. From an administrative, through to academic or student experience perspective, it can play a big role.
- Schools have access to data and diagnostic tools which, once analysed, can improve learning methods, enhance teacher performance, or flag students that are more likely to drop out or need extra help.
- By enhancing data analytics capabilities within schools, they can act in real time - not just report on it afterwards.

What each case study also demonstrates is that if data is the answer for education, what is the question? We need to know more about what we are looking for if we are to create joy in learning and improve every student's learning journey.



Ellen Koshland

Founder

Australian Learning Lecture

JOY AND DATA:

the inaugural Australian Learning Lecture, delivered by Sir Michael Barber



Sir Michael Barber

December 2017

Sir Michael Barber is a world-leading authority on the effectiveness of government. He is the Founder and Chairman of Delivery Associates.

In March 2015 his latest book *How to Run a Government so that Citizens Benefit and Taxpayers Don't go Crazy* was published by Penguin to wide acclaim.

In 2001, he founded the Prime Minister's Delivery Unit in No 10, Downing Street, which he ran until 2005. In this role he was responsible for ensuring delivery of the government's domestic policy priorities across health, education, crime reduction, criminal justice, transport and immigration. The sustained focus on delivery from the heart of government, and the processes the PMDU developed, were a significant innovation in government, of interest to numerous other countries and global institutions such as the IMF and the World Bank. Tony Blair described the PMDU as "utterly invaluable."

From 2005 to 2011 he was a partner at McKinsey and Company where he played a leading role in creating a public sector practice and founded the global education practice. Building on his experience in the UK, he advised a number of city, regional and national governments – in Malaysia, Ontario, Los Angeles and Maryland among others – on improving delivery of domestic policy.

From 2011 to 2017 he was Chief Education Advisor at Pearson where he drove a focus on efficacy and learning outcomes. In April 2017 he became the first Chair of the new Office for Students which will regulate the higher education sector in England.

Since 2009 he has visited Pakistan more than 50 times to drive delivery of improved outcomes in the education and health systems in Punjab.

With his leadership, Delivery Associates has worked with government leaders in the developing and developed world to enable them to deliver their domestic policy priorities. These include the governments of Canada, New South Wales, Peru and Gauteng in South Africa.

His past publications include *Instruction to Deliver (2008)*, an account of his four years in No 10 Downing Street, described by the Financial Times as "one of the best books about British Government for many years", *Deliverology 101*, and *Deliverology in Practice* with Nick Rodriguez.

From 2014 to 2016 he was Chair of the World Economic Forum Global Agenda Council on Education.

He is a distinguished visiting scholar at Harvard School of Public Health and holds honorary doctorates from The University of Exeter, The University of Wales and The University of Warwick. In 2005, he was knighted for his services to improving government.



Introduction

In the modern world, Joy and Data are often seen as opposites; the one creative, spontaneous, warm, and spiritual; the other, scientific, bureaucratic, cold and analytical. In part this is because we look back to the mid-Victorian era through the historical miasma of the 20th Century, during which the terrors of totalitarianism divorced scientific analysis and data from judgment and ethics.

I want to argue that we need to reclaim data as an ally in improving the human condition, and that, as one ingredient alongside others such as analysis, informed ethical judgment and, not least, teaching and learning, data can and does bring joy.

Meanings

Maybe we should start with some definitions. “Data”, according to the Oxford English Dictionary, is or are “facts and statistics gathered together for reference or analysis¹.” (Generally I am going to use ‘is’ because that is the colloquial norm, if not grammatically correct.) In the Victorian era they made sure that such facts and statistics were gathered in the reference section of libraries and later in government departments. In our era, with the explosion of digital technology, facts and statistics are instantly available everywhere. (The challenge is to discriminate the good and well-founded from the poor and unfounded.)

It is easy to see this spread of data into every corner of our lives as a threat – and there are dangers to which we will come in a moment – but it is also possible to see it as part of a new democratization; data is everywhere and belongs to everybody, rather than just experts.

Before we go further though we also need to define “Joy” which the OED describes as “a feeling of great pleasure and happiness².” It is important to my argument later to distinguish joy from “fun” which is a much shallower emotion. You can feel “profound joy”; the language won’t let you say “profound fun”. Similarly, I want to distinguish joy from success. Of course, success can lead to joy but success,

as the England cricket team constantly remind us, is transitory. More fundamentally, there are many people who experience success without ever experiencing joy. Sometimes, indeed, people experience success at the expense of joy. Importantly, too, joy requires a connectedness between an individual and others, between an individual and a landscape, between an individual and an idea or a sense of alignment, of elements coming together, in a special or surprising way; it is therefore elusive as well as profound.

Cycle of joy?

My belated cycling career is certainly not going to lead to success in any recognised form and there will be long patches of it when it is anything but fun but there will be joy – the joy of achievement as I complete rides that a year ago I would have ruled out, the joy of experiencing a landscape in a way that is impossible in a car and, above all, the joy that comes from learning both new knowledge and new skills, from what George Herbert, long ago, described as “something understood.”

And here without doubt the data – play a vital part. The data raise questions and provide an evidence base, but to make sense of them requires interpretation and for that conversation is the key. My cycling coach’s deep knowledge of cycling along with the dialogue between us about the data, bring the learning; the learning and the application of learning, bring the joy. The data far from being in opposition to the joy is, therefore, an important ingredient of it.

That might be all there is to say on the subject except for the fact that there are four misconceptions, which need attention if this argument is to be sustained.

MISCONCEPTION ONE: The growing ubiquity of data in our lives undermines our creativity and inspiration

You look back on a cycle ride which at the time just felt very, very hard, and you realise that everything aligned – your fitness, your mental state, your bicycle and the landscape you were riding through – and you felt what psychologists call “flow.” These moments can and do occasionally occur spontaneously –

out-of-the-blue, as we say. In cycling or most other activities, though, they are much more likely to occur as a result of explicit learning, training, practice and experience.

“The data raise questions and provide an evidence base, but to make sense of them requires interpretation and for that conversation is the key.”

To play the Beethoven Violin Concerto may well be joyful, even sublime, but it doesn't happen without a lot of hard work, perhaps misery, behind the scenes. The point is the listener may experience the joy without the hard work just as the viewer of a painting may; but the hard work is still essential to the performance. In fact, you could argue that part of the pleasure in viewing a great painting or a great performance is that you can experience the joy without all the hard work. Or to put it the other way round, the hard work of the skilled practitioner enables him or her to share the joy with the rest of us.

This of course may be the reason why so many people peddle the myth that data undermines creativity and the joy that may come from it. In a world where the expert takes the strain and the onlooker experiences the joy, then for the majority, data and joy are separated. We hear the concerto, watch the play or see the match but don't have to experience the disciplined regime, based on data and feedback, which made the performance possible.

As the data and the means of gathering it, become ubiquitous we can all share the data and, if we choose, the pain. I can't and will never be able to cycle remotely as well as the professionals but I can use the all the tools they use to improve my performance. It is true that in doing so some of the mystique of top performance is lost and with it the element of joy that comes from surprise, but in its place I get a deeper understanding of what top performance demands – and there is genuine joy in that. It is tempting to think that the joy that comes from mystique is somehow preferable to the joy that comes from understanding but to accept that argument is to undermine learning and indeed science altogether.

In spite of this the critics of data often seem to be winning the argument. They make the case that it is not just creativity that is at odds with data; it is inspirational leadership too.

I'm in favour of inspirational leaders; I'm also in favour of those condemned as “bean-counters”! Not one or the other. Both. Someone has to count the beans.

This is the day-to-day reality of every great enterprise, whether exploring the further flung corners of science, managing a company or leading an educational institution such as a school, university or library. The daily grind, informed by whatever data is available, is as important as the inspiration. Any joy that is felt by staff or users of the service depends at least as much on the former as the latter. Moreover, the better the data, the greater the efficiency. In other words, improved data will reduce the grind and maximize the inspiration and therefore the potential for joy. Far from being in contradiction with joy therefore good data makes it more likely.

“The daily grind, informed by whatever data is available, is as important as the inspiration.”

MISCONCEPTION TWO: The data tells you what to do

There is another misconception about data that has become widely held; that somehow it is in conflict with human judgment, indeed that it is replacing human judgment. People tell you, as if you needed telling, that not everything can be measured. As a statement of the obvious this is harmless; as an excuse for not gathering data on what can be measured – which is often why the argument is deployed – it is dangerous. After all, as Douglas Hubbard comments measurement can be defined as “a set of observations that reduce uncertaintyⁱⁱⁱ...”

But this misconception goes further too. There are plenty of people who reject the point I've just made but still advocate ‘evidence-based policy’ as if the evidence, based presumably on the data, will tell you what to do in any given situation. This is not the case.

If it were remotely likely that the data would tell you what to do, it would happen first in some activity that was purely cerebral. In fact on 12 May 1997 I thought exactly this would happen in chess. That was the day a computer called Deep Blue beat the then World Chess Champion, one of the all-time greats, Garry Kasparov. I thought a line had been crossed – up until that day, human intelligence beat machines; after that day the reverse. Remarkably, in spite of Moore's Law and the incredible increases in computing power, that is not what happened. The brilliant young Norwegian,

Magnus Carlsen, who recently defended his World Champion status successfully, is still able to beat the best computers.

How can this be? He says it is because the computing power now available enables him to synthesise better than any of his predecessors what is known; he then adds a twist of human ingenuity. The eagle of computing power carries him to previously unreach heights and then the wren of human judgment clinches the extra inches that bring victory.

I find this heart-warming, an affirmation of humanity. If it is true in as abstract an activity as chess how much more so in policy whether in government, business or a public institution, such as a hospital or a school. Data informs, humans have to exercise judgment. This point applies at the micro-level as well as the macro-level, the classroom as well as the school, the operating theatre as well as the hospital. The evidence is extremely valuable of course and provides insights into what is likely to work and what isn't - but it doesn't tell you what to do.

Nor does it tell you how ambitious to be. In setting goals, analysis of the data and benchmarking will certainly provide valuable insights. If you are a government, you can look at how other countries do, for example, and choose which ones to try to emulate. Or you can look within your system and decide you'd like all hospitals to match the performance of the best 10 percent or the best 25 percent or the best 50 percent but it is still your decision which of these very different goals to pursue. In other words, the setting of a goal requires both analysis of data and human judgment.

There remains a further, even more important, aspect of deciding what to do; not what is possible but what is right. Here data can again inform but otherwise offers no guide at all.

While I was working in Downing Street, my colleagues and I discovered - by reading it in the newspaper - that 5,000 people a year died in hospital from infections they acquired after they had been admitted. We were appalled. When I raised it with the country's top health official he commented, "It's always been like that; hospitals are dangerous places." I found the complacency as frightening as the facts and said the state of affairs was morally unacceptable. Imagine, I asked, if 5,000 people in Britain a year died in plane crashes? We took on the issue of hospital-acquired infections and within two years the National Health Service had reduced the number of deaths to 3,500 - still unacceptable but undoubtedly progress. Here, in the top official,

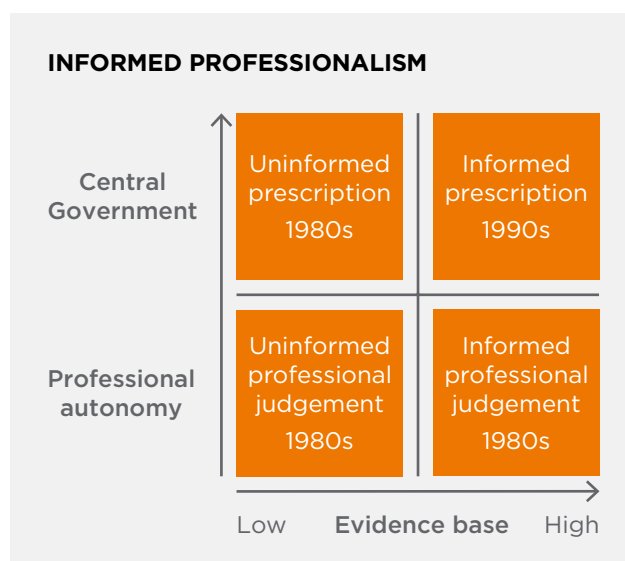
we have a not unusual case of deep expertise being used to justify the data rather than change it. It took naïve outsiders to bring a moral challenge to bear. If you allow the data to be deterministic - "inevitable" - inadvertently you accept a morally unacceptable status quo.

In any case, the main point is that, you have to decide what is morally right as well as, in the famous phrase, what works; the data will help with the latter but not the former.

MISCONCEPTION THREE: Data replaces professional judgment

This leads to a significant point about professions and their ethics. The development of professions historically is to do with trust - we can't all know what we need to know to ensure our health or educational progress so we trust professions. Implicit in this trust is a belief that they have both the expertise and ethical perspective to make good decisions on our behalf. We accept that there will be mistakes because individual situations are complicated and uncertain but we expect that such errors will be in good faith.

As data in fields such as health and education becomes more ubiquitous, it is surely not unreasonable that we should expect the relevant professions to take it into account. When we hear professions rejecting and questioning data and trying to defend the secrecy of their practice - we know what is best, trust us regardless - we are right to be suspicious. It was as a result of often finding myself in my government days in this unproductive loop that I developed the idea of "informed professional judgment", illustrated in the diagram.





In the late 1970s when I started teaching just north of London – and I don't think it was that different in Australia – after a year's theoretical training with a couple of brief teaching practices, you qualified and started teaching. Someone shoved you through a classroom door on your first day and after that you were on your own – apart of course from the 30 or so ruly or unruly students who may or may not have been at their desks. You sank or swam. Hardly anyone came to see you teach and such advice as you got was the odd tip from an experienced teacher over coffee by the battered kettle in the corner of the staffroom. This is what I call uninformed professionalism – there were of course great teachers but there was no systematic attempt to build a body of proven practice and share it across the profession.

In the late 1970s and early 1980s governments, increasingly aware of the importance of education to future productivity and economic growth, began to attempt to reform this palpably inadequate state of affairs. The seminal moment in Britain was actually just before I began my teaching career when, on 18 October 1976 at Ruskin College in Oxford, the underestimated Jim Callaghan became the first Prime Minister in British history to make a major speech about education. Gently he reminded the teaching profession that:

“The balance was wrong in the past. We have a responsibility now to see that we do not get it wrong again in the other direction. There is no virtue in producing socially well-adjusted members of society who are unemployed because they do not have the skills. Nor at the other extreme must they be technically efficient robots. Both of the basic purposes of education require the same essential tools. These are basic literacy, basic numeracy, the understanding of how to live and work together, respect for others, respect for the individual. This means requiring certain basic knowledge, and skills and reasoning ability. It means developing lively inquiring minds and an appetite for further knowledge that will last a lifetime.”^{iv}

Incredibly this gentle admonition caused a storm of controversy. The bigger problem though was that governments, Jim Callaghan's included, did not know at that point what good government-led reform looked like. They knew only how to spend money and build schools. We had entered the era of uninformed prescription which went on to dominate the 1980s and early 1990s. Eventually, with enough mistakes accumulated across the world – as well as some successes – governments became more effective at education reform. Research in the fields of school effectiveness and school improvement, often with great Australians such as Brian Caldwell and Peter Hill in the lead, provided a knowledge base.

Governments around the world began to embark on whole system reform. The impressive rise of the Singapore education system became widely noticed along with the progress in US states such as North Carolina. We in Britain, among others, watched with interest. And then there was the Blair administration in England; we unashamedly used central power to shift outcomes. We made mistakes but we also made a positive difference to student achievement. This was the era of informed prescription. We had worked out the basic characteristics of successful whole system reform.

But this could only take the process of reform so far. Governments can mandate adequacy but they cannot mandate greatness; greatness has to be unleashed. That requires the next phase, which is informed professionalism. Here government's role is to create the circumstances in which success is possible while teachers and school leaders lead the way to greatness. And part of the context has to be good, close-to-real time data at classroom, school and system level. Only in this way can we put the "informed" in informed professionalism. Globally what you see is that we are in a transition phase with some teachers and school leaders embracing transparency and data-informed practice while others – aided and abetted by so-called experts who should know better – stand blockheadedly against the gathering or use of any data at all. Indeed, some teacher unions still oppose classroom observation as well as any form of testing, implicitly longing for a return to uninformed professionalism, in spite of its obvious inadequacy.

“informed professionalism, aided by modern technology and informed by excellent data, has huge potential to unleash a transformation of teaching and learning”

So where is the joy in all this? There are some who argue that the data and measurement have replaced joy in teaching. They recall a golden age before governments worried about the performance of education systems; when teachers were individuals, when there was less pressure for outcomes and when Mr Chips was alive and well. There were indeed teachers whose lessons were joyful and whom students remember.

The dark side of the reality of back then though is all too easily forgotten – a majority of students leaving school with few qualifications; disaffected students who in effect did deals with their teachers; we won't bother you, if you don't bother us; racism that sometimes went unchallenged; girls who too often weren't expected to do well. And worse still; I came across a school in Manchester as late as the early 1980s where physical punishment was applied over a thousand times in a single year. There was no golden age – and the genuine joy for some was outweighed by the misery for the many who left school to find themselves totally unprepared for the demands of the late-20th Century.

By contrast, informed professionalism, aided by modern technology and informed by excellent data, has huge potential to unleash a transformation of teaching and learning, which in turn could drive greatly enhanced performance. It will be demanding and challenging but if we believe that learning itself has the capacity to bring joy, then the future of education will be a great deal more joyful than the past. Indeed, for many students the present is already far more joyful than for previous generations.

This is because there is surely joy in deeper understanding, even, or perhaps especially, when it has been a struggle to get there; a mathematical proof, a convincing historical explanation or an elegant linking of previously unconnected ideas. There is joy for the teacher as well as the student; the profound joy that comes from bending the arc of a child's prospects towards success.

So if I'm rejecting the idea of "evidence-based policy", does that mean I reject evidence? I hope I've made clear that is not the case. I advocate "evidence-informed policy" and "informed professionalism" because it makes clear that any decision requires more than the evidence. It requires judgment, analysis and ethics too. If you put it mathematically it might look like this.

***DATA x ANALYSIS x ETHICS x JUDGMENT
= GOOD DECISIONS***

In short, data and professional judgment are not in conflict, they go together.

MISCONCEPTION FOUR: Personal data will be abused by governments and businesses (so we should make sure it is not collected)

We are drowning in “the digital ocean”^v. Every electronic transaction, every mobile telephone call, every email and every text can be recorded and stored not just by the sender and receiver but the carrier – and much of that data can be intercepted too, perhaps by benevolent organisations for benevolent purposes, perhaps not. People are understandably outraged when they discover that government agencies or businesses are intercepting and/or collecting such data without their knowledge.

Moreover the era of Big Data means not merely the gathering of data in this way but the possibility of overlaying data sets one upon another and making new connections and inferences. According to *Wired Magazine*, almost 90 percent of Americans can be identified by combining just three facts – zip code, age and sex^{vi}. And mobile phone companies, which know from our movements where we work and live, can do much the same.

As education and learning go online, data is increasingly being captured at the level of individual mouse clicks about both individual learners and massive groups of learners. Such data provides huge opportunities for analysis, which could in turn lead to significant improvements in the quality of education. Simultaneously it carries risks and threats to privacy.

The joy in this comes from the extraordinary capacity to enhance learning in close to real time. I keep coming back to my bicycle because it provides a lighthearted, non-threatening (unless you count the broken bones I’ve suffered this year) way of exploring the issues at stake in this lecture. The data the computer gathers as I cycle can be shared not just with my coach, but through websites such as *Strava*^{vii}. As a result, I can benchmark my rides on a particular stretch of road or one of Devon’s brutal hills against countless other riders, whom I never meet, and thus both compete and learn simultaneously. In this way, I take control of my own learning and become an informed learner. There is joy in that for sure. The data and the technology have undoubtedly therefore massively enhanced the human capacity to learn. We, humanity, have barely begun to tap the potential of this new capacity.

Is there a neat resolution to the moral dilemmas here? I don’t think so. The solution is certainly not to seek to avoid collecting and learning from data. That would not just be Luddite; it would be to miss the opportunity to put the science in the science of learning. I’m left with the argument to which I keep coming back; namely that we collectively have to take responsibility for the ethics that surround the explosion of data and create regulatory frameworks that can maximize the benefits and minimize the risks. If you ask most people most of the time they advocate both transparency and privacy, two important ideas, which are necessary and at the same time in tension. The best we can do is to arrive at sensible, ethically-sound rules which manage the tension. The challenge at the moment is for the ethics to keep up with the rapidly advancing frontier of the data revolution.

In other words, the problem is not the data; the issues, both ethical and statistical, relate to how human beings choose to make use of the data. The risk is that through false interpretation of the data or through a failure to recognize that the data is incomplete, human beings mislead themselves; or, worse, that by manipulating the data or the presentation of it, one group of human beings deceives another.

These distinctions are important because if you blame the data you might choose to avoid collecting data altogether whereas once you realise the people are in control, you can focus on their capacity to make good use of the data they have. It may not be for everyone but I have found that debating and arguing with informed colleagues about complex data, trying to work out what story it tells, can be truly joyful. The ethical perspective in such debates is a vital ingredient.

The transformation of education

With these misconceptions out of the way, we can now turn to education and its transformation. Let’s imagine for a moment a teacher who began her career in around 2005 and retires in 2040. Soon after her retirement, she is sitting in a rocking chair on a verandah looking at – choose the view – the Blue Mountains, the North Devon coast near where I live or the great cityscape of Rio de Janeiro. Her grandson asks her what she did in her career.

There are two possible answers she could give.

She could say, *“Teaching became more and more a chore. It wore me out. My colleagues and I fought tooth and nail to preserve the old teaching profession where the teacher ruled the classroom, decided the curriculum and prepared the lesson plan – and was left alone to do so. We held off as much as we could the tide of change that governments, driven by economic imperatives and technology, pursued. I became a teacher to make a difference but I look back and think – apart from one or two kids I really liked – I hardly did. I hope you won’t become a teacher.”*

Or she could say, *“I thank my lucky stars that I became a teacher when I did. I had gained enough experience by the time the technology and data revolution came that I could seize it, along with my colleagues, and make it work for the students. Of course, governments were struggling everywhere to move to the idea of stewardship – the idea that you leave a system better than you found it. Once we adopted informed professionalism as our mantra the transformation fell into place for government as well as for us. We became the creators of the future. The technology became ubiquitous, the data helped us map the path forward for every student. Individually and collectively we were able to demonstrate the huge difference we made not just to students but to society as a whole ... sorry, I am getting carried away with the jargon. What am I saying? It was challenging and deeply rewarding. Sometimes it was joyful! I hope one day you’ll want to be a teacher too!”*

“we should not think of school as being solely about preparation for the future but also about building a community of work and learning, a productive place where today matters because every day matters.”

What would it take to ensure the latter scenario rather than the former?

First, we need to think about the purpose of school. It is important that at school students learn the knowledge, master the skills and develop the attitudes that will enable them to succeed in the 21st Century. But we should not think of school as being solely about preparation for the future but also about building a community of work and learning, a productive place where today matters because every day matters.

My good friend Peter Hyman, has set up a beautiful free school in the East End of London.

The simple, profound purpose of the school is, he says, to produce beautiful work – each piece of work the students produce, whatever the subject and whatever its nature, is important in and for itself. Peter does not advocate this because he doesn’t care how well the students do in traditional exams. It is true he would like to see an assessment revolution – which is indeed required – but in the meantime he fully expects his students to succeed in traditional exams because of, not in spite of, the emphasis on beautiful work.

There are two implications of Peter’s thinking I want to draw out. First, the thinking is based on that of a craftsman or craftswoman – and they have always valued precision and data. Indeed, the invention of eyeglasses in the fifteenth century, which made much greater precision possible, can be plausibly considered the start of the industrial revolution. Precision and measurement on the one hand and beauty and joy on the other, go together for the craftsman – why so often in education do we see them as in contradiction?

Second, the leadership for the kind of change Peter is bringing about can only come from among educators, not government. Government can create circumstances in which this kind of leadership is more likely but it cannot make it happen. Unless bold leaders from within education systems step forward, as Peter and many others around the world are doing, the necessary transformation will not occur.

With this background let’s now look at what the transformation might look like starting with a students’ perspective. In our 2014 report on the future of education in Massachusetts Simon Day and I described the high school of 2030 as follows.

“A lot of the content you needed to succeed in high school you could now get online at home. There were numerous sources, recommended by the school. For example, the state’s leading universities such as Harvard and MIT incentivized their professors to produce online lectures, with marvelous graphics, specifically for high school students, because by doing so they generated the supply of future graduates and transformed the image of universities.

Even so, going into school each morning was still the expectation. As always, the social aspects of school had their appeal but the motivational power of the whole learning experience was now of a different order. No two days were the same. They involved a different mix of individual study, teamwork focused on solving problems, seminar discussions and arguments about the content learned at home, large classes with top lecturers – beamed in – on important curriculum themes and one-to-one sessions with a personal tutor reviewing progress on an individual learning plan and thinking through the next steps. In effect these were counseling sessions. Then sometimes for an entire week, the school as whole would focus on some major issue affecting the community and apply its educational and human capital to solving the problem or enacting the solution.

The most talented students were assembling university-level courses in their learning profiles; others were mastering vocational skills, such as coding, plumbing or customer service. Their learning profiles described not just their progress on these outcomes but their progress too in learning the leadership, interpersonal and team working skills that the economy valued so highly.

Since 2015 many school buildings had been redesigned with some of the old classrooms being let as design studios, startup incubation spaces and offices. Increasingly as students moved towards graduation, the school was a place where learning and work seemed to merge, just as in workplaces across the country work and learning were becoming synonymous.^{viii}

Note how in the description of the school of the future, data is ubiquitous and measuring progress not just on academic performance but also on the wider skills and attributes, such as leadership and teamwork, which we know are becoming vital to future success and fulfilment. The report might have mentioned grit and resilience too, the qualities required to persist when the going gets tough.

Note also the implied totally transformed classroom or maybe we should say learning space – open and flexible with ubiquitous technology, very like as it happens the brilliant young people in my team at Pearson designed for us.

In spaces such as these students are sometimes working alone, perhaps at sophisticated educational game or simulation, sometimes in small teams and sometimes in a whole class or even bigger group. The teacher is no longer just a transmitter of knowledge, though she or he may do this periodically, but nor is she or he a mere facilitator either. Rather the role is that of activator, in John Hattie's evocative phrase; someone who injects ambition, provokes thought, asks great questions, challenges mediocrity and brings passion and insight to the task at hand; and who at the same time, drawing on excellent data, has a clear personalized picture of every student in the class^x. As a result the teacher is in a position to have an informed conversation with each student about where they are, where they want to go and how they might get there. Many schools now keep excellent precise records in student progress which they share and discuss with the student and their family. This has the power to unlock potential in ways that were never possible before.

“Many schools now keep excellent precise records in student progress which they share and discuss with the student and their family. This has the power to unlock potential in ways that were never possible before.”

In addition, the teacher will be part of a team of informed professionals preparing entire programs for students. I read every now and again, on Twitter recently, for example, that teachers in the future will be “learning designers not implementers”. This is the purest nonsense. They will be learning designers AND implementers. What good is learning that is designed but not implemented?

Moreover, the teacher through the providers of the online materials, which will have replaced textbooks by then, will also have access to data from far beyond the school that will enable them to answer such questions as; has anyone successfully taught this sequence of geometry to a group of Turkish boys who are in danger of falling behind and, if so, how did they do that? The teachers who solve such problems won't have to wait to be asked how they did it; they will be posting lesson plans and videos in easily usable formats for their fellow professionals to draw on. They will receive a royalty every time their solution is downloaded, just as an artist does on iTunes.



In this way, innovation will become built into the way the entire teaching profession works. Occasionally, there will be a major breakthrough but, just as importantly, continuous improvement will be integral.

The massive difference in the performance of a bicycle over a century or even the last decade or so is not in radical redesign but in the refinement of details; and the identification of those details depends on the gathering and analysis of data.

All this, of course, has implications for school leadership too. That we will want instructional leaders goes without saying; our school leaders will need to be capable of recognising and inspiring excellence while also challenging and questioning mediocrity. They will need to spark innovative thinking and decide when to unleash a radical experiment and when to hold back.

But this will not be enough. They will need too to think strategically. As Michael Fullan and Katelyn Donnelly argue in *Alive in the Swamp* – they will need to understand that the digital revolution will only bring a transformation in learning outcomes, when school leaders simultaneously change pedagogy and school organization^x. Finally, school leaders will need to engage parents and communities in a dialogue about education and its implications for individual learners and society as a whole.

Such analysis of the future is influencing education providers and companies too. At Pearson we have put educational outcomes at the heart of our strategy. My team is responsible for ensuring that all Pearson's products and services become capable of demonstrating their impact on learning outcomes,

their efficacy. We have made public how we are going about this and welcome dialogue about how we could improve our approach. We have made a commitment that by 2018 our annual report will provide as much detail, independently audited too, about our efficacy as about our financial results. This year's annual report was a significant step in this direction. In effect we will become as accountable to educators and learners as we are to our shareholders.

Enabling such radical change across systems is the task of government too. Politics will vary across time and place but the task everywhere is surely stewardship; seeking always to leave the system better than you found it. What does it take to be an effective steward of a system as we move into this new era?

First, government needs to set strategy and direction, looking five, ten or twenty-five years ahead to do so. It needs to interpret the world and think through the implications for the system. In part this is an analytical task and increasingly it involves dialogue with other countries, informed by benchmarking data from OECD-PISA and elsewhere. But it is also more than that; there a desperate need in many countries for government to open up a dialogue with people – and to level with them in plain language – about what lies ahead; and a central fact about the 21st Century, is that for any person with both a great education and the capacity to keep learning, the world is one of boundless opportunities; for anyone without those attributes it is a threatening and unforgiving place.

Second, stewardship of any sector including education involves setting the rules and providing the data that enables performance to be understood and decisions to be informed at every level from classroom to country. As Margaret Spellings, the former US education secretary, used to say, "*In God we trust. For everything else we need data.*" And increasingly this data should be publicly available and open to analysis by anyone with the interest in doing so.

Third, there will be growing emphasis not just on funding education – which is vital – but also on spending money wisely not just because we live in an era of austerity but also because people's willingness to pay taxes shows no sign of increasing. Yet their aspiration for major improvements in the services government provides, including education, is not diminishing. Fortunately the quality of the data and the growing evidence base will enable precision-targeting of policy interventions in place of blanket regulation. This should have the double benefit of being both more effective and more economical.

In the Punjab the Chief Minister and his team look at maps of the 36 districts monthly and direct their efforts precisely at the places where there are problems. Of course, they retain, as all good governments should, the capacity to intervene where there are major problems – government after all should be the guardian of the citizens’ interests – but most of their actions are much more targeted. This is just one example of how data enables precision – and if they can do it so well in Pakistan there is no excuse for not doing so anywhere else^{xi}.

Regulation, of course, will remain important, to ensure fairness or appropriate use of public funds, for example, but increasingly it should become more like tending a garden. This indeed is the implication of the whole “Nudge” argument under which citizens are empowered and given choice while the government role becomes one of putting in place “choice architecture” and incentivising the behaviours that benefit the wider community as well as the individual^{xii}. None of this is possible without a regular flow of good, close-to-real-time data.

Fourth, government has a responsibility to ensure the supply, capacity, culture and quality of the key professions in any service. The key to this in relation to the teaching profession is the case for informed professionalism made earlier and for teachers and their leaders as well as government to put learning outcomes, short and long-term at the heart of their dialogue.

Once it becomes a steward in the sense I’ve described, government will rely on data but will not become the provider of joy. During Blair’s second term while I was in No10, the Department for Education in England published a policy document on primary education called *Excellence and Enjoyment*. I found the title absurd, not because I’m opposed to enjoyment in primary schools I hasten to add, but because I don’t think there should be a government policy on it! Government’s role is not to provide enjoyment or joy but to create the conditions in which they become possible, even likely, for teachers and students classrooms.

I’ve often said before that the road to hell in education is paved with false dichotomies; Joy and Data risk becoming another one! Let’s reclaim them and unite them, in pursuit of an education for everyone that is rich, deep and fulfilling. That way we will enable future generations to seize the immense opportunities that lie ahead.

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ⁱ "Definition of Data in English." Oxford Dictionaries, 2015

ⁱⁱ "Definition of Joy in English." Oxford Dictionaries, 2015

ⁱⁱⁱ Hubbard 2010: 21

^{iv} Callaghan 2001

^v Behrens and DiCerbo 2014

^{vi} Venkataramanan 2014

^{vii} strava.com 2015

^{viii} Barber and Day 2014: 29

^{ix} Hattie 2008

^x Fullan and Donnelly 2013

^{xi} Barber. *The good news from Pakistan*. 2013

^{xii} Thaler and Sunstein 2009

THE TARANGANBA WAY OF READING

at Taranganba State School (Queensland, Australia)

“In Year Three I wasn’t that good at reading but my reading has really improved. My fluency has improved the most because I read to an adult every day and I have to read aloud. This practice has really helped as well as an adult asking me to stop, they themselves read it and then I read again. I’m including more words in my writing.

Ava, Year 5, Taranganba State Schoolⁱ

What is the problem?

We live in a world that increasingly relies on our capacity to read, and we are facing a future that demands that our young people will be digitally literate and equipped with enterprise skills, such as critical thinking and collaborative problem solving. Yet it is estimated that 10-16% of 5 to 16-year-olds in Australia have reading difficulties such as dyslexia or inadequate comprehension skills.ⁱⁱ

Associate Professor John Munro says that “students who have difficulty converting written information to knowledge are at a severe disadvantage in the world of the twenty first century.”

For Katrina Jones, Acting Principal at Taranganba State School, a regional school in Yeppoon, Queensland, the problem for her students was evident. In 2011 NAPLAN data showed that Year 3 Reading levels at Taranganba were below the State and National Mean. The school has 686 students, including 7% indigenous students and 7.3% students with a verified disability, and a further 10% identified under the Disability Discrimination Act, with most families falling into the low to middle socio-economic bracket. While the school’s goal was for all students to be performing at or above the National Mean, the school realised that their reading strategies were not making enough of a difference.

Associate Professor John Munro says that “students who have difficulty converting written information to knowledge are at a severe disadvantage in the world of the twenty first century.”ⁱⁱⁱ For those students who have not built a strong base in reading skills in the early years, the problem is exacerbated by late primary and early secondary school when there is an increasing focus on self-managed learning and a need to access a range of information sources.^{iv}

The school leaders at Taranganba knew that they needed to find a more effective approach to reading, and one that would provide a solid foundation for all their students.

How did the Taranganba Way of Reading start?

In November 2013 Taranganba State School began working with John Munro, to implement his High Reliability Literacy Procedures (HRLTPs). John was engaged by the Capricorn Coast Cluster, a group of eight primary schools. The High Reliability Literacy Procedures are a set of explicit literacy teaching procedures that teachers in all subject areas could use to enhance students’ literacy knowledge.

Taranganba set an improvement agenda with three aims: to create a culture of engaging learning that improves achievement for all students with challenging learning experiences that develop reading across the curriculum; to develop professional practice; and, to improve school performance to ensure better outcomes for students.

Working with John Munro, teachers and leaders learnt more about how children learn to read; and then a team of Literacy Leaders worked intensively with John to develop models of practice which could be used across the school. This approach focussed on strategies that enabled students to construct meaning from texts, with an emphasis on strategies that must be planned, deliberate and explicit.

Initially, the school used funding from the *Greater Results Guarantee (2014 - 2015)* and *Investing for Success (2016 - 2017)* to place additional staff in the Years 1, 2 and 3 classrooms so that the reading processes could be embedded. The following year the funding continued, so the program expanded to include all year levels – Prep to Year 6. Teachers' aides, mainly recruited from the school's families, were trained in the Taranganba Way of Reading with the two-fold benefit of increasing learning in the classroom and broadening understanding of this approach across the school community. Now a common language for reading is used across the school, by students, parents, and teachers.



How does the Taranganba Way of Reading help?

The US-based National Reading Panel was asked to review all the research available (more than 100,000 reading studies) on how children learn to read and determine the most effective evidence-based methods for teaching children to read. In 2000 the panel reported that the best approaches to teaching reading includes: explicit instruction in phonemic awareness; systematic phonics instruction; methods to improve fluency; and, ways to enhance comprehension.^v

The High Reliability Literacy Procedures reflect this research with a clear sequence and structure for learning reading. At Taranganba the program is now embedded into the teaching sequence for each week. Lauren McDonald, a teacher at Taranganba, explains that students know there is a clear structure to the week and they know the expectations for reading sessions. Strategies such as 'Getting Knowledge Ready' are implemented every Monday in every classroom, and applied across the curriculum. Lauren can see that this skill of recoding students' non-verbal knowledge into verbal form prepares students to build their vocabulary and deepen their comprehension in all subject areas.

Teachers' aides are timetabled into classrooms to enable smaller reading groups. An additional benefit is that students see familiar faces in their reading sessions, and have the opportunity to build a strong rapport and shared love of reading with that adult. Katrina recounts how one teachers' aide asked to remain with a particular group for an additional week, because the group hadn't quite finished a book which they all enjoyed, and they wanted to share the pleasure of the ending together. The work of these small reading groups enables students to discuss the text, pose questions and unpack unfamiliar words in context. The school is seeing real gains in students' acquisition of vocabulary.



How is data useful?

“What started as a plan for how a guided reading lesson needed to be taught across all year levels then became more powerful, around collecting data about our students, and teachers working together looking at student data and working out the next steps to improve teacher practice and student outcomes” explains Katrina Jones. A whole school scope and sequence was developed, with data collected and analysed by teachers every five weeks. The school has developed their own reading reviews, based on John Munro’s work. These reviews are used every five weeks and give teachers the data to review what has been learned and therefore what strategies need further teaching and consolidation.

“data used to be ‘done’ to the teachers. Now our teachers ‘own’ the data.”

All teachers from a year level are released from playground duty to meet in teams to analyse student data and work samples and plan future actions. Katrina explains that “data used to be ‘done’ to the teachers. Now our teachers ‘own’ the data. They check whether the data is matching their observations; they focus on student growth. Importantly they use the data to look at hot topics – how do we extend the top readers? How do we support this group? Are our students applying new vocabulary in their writing?” She notes a real shift in teachers’ attitudes towards data, and they see it as a way to celebrate student growth.

“Student data is bringing joy to learning” Katrina continues. “Importantly we have questioned what we value, and as a consequence the assessment schedule has been pared back. We have asked: *What data do you really value? Which is the data with which you engage?*”

Term Three, Week 10 – Year 3 and 4 Reading Review

Alligator or Crocodile?

Crocodiles and alligators look rather alike. How can you tell which you are looking at? One difference is the shape of their skulls and jaws. An alligator’s skull and jaw are broad and rounded. However, a crocodile’s skull and jaw are narrow and pointed. Crocodiles also show a lot more teeth than alligators when their jaws are closed. The alligator’s teeth are white daggers.

Another difference is the colour of their scales. Alligator scales are usually darker than crocodile scales.

Alligators and crocodiles both live in areas where it is as warm as toast but in different places. Alligators live mainly in the southern United States of America. Unlike alligators, crocodiles are found in many places. They live in Asia, Africa, Central and South America, and northern Australia. So if you are in Australia, you are looking at a crocodile unless you are at the zoo.

Still not sure what you are looking at? Well, both may attack people so it is best to keep well away!

Compare and Contrast

1. Fill in the compare and contrast chart.

Alligators	Crocodiles
How are they alike?	
•	
•	
•	
How are they different?	
• skull and jaw -	• skull and jaw -
• teeth -	• teeth -
• scales -	• scales -

Vocabulary: Figurative Language

2. Underline in red the simile in the text about alligators and crocodiles.

3. Underline in blue the metaphor in the text about alligators and crocodiles.

4. Read the following sentences and write whether they are examples of metaphors (m) or similes (s).

- Life is a roller coaster. _____
- The clouds were like ice-cream castles in the sky. _____
- Her hair was as soft as a spider web. _____
- My brother is a pig when he eats. _____
- The clouds sailed across the sky. _____

Fact and Opinion

5. Read the following sentences and write whether they are facts (f) or opinions (o).

- I much prefer crocodiles to alligators.
- Crocodiles show more teeth than alligators.
- Alligator scales are usually darker than crocodile scales.
- Some people believe that crocodiles are more aggressive.

Vocabulary: Word Meaning in Context

6. Complete the word map for the following word and definition.

Marvellous

- causing great wonder, extraordinary
‘these marvellous toys are fun to play with’
- extremely good or pleasing
‘you have done a marvellous job’

Put the definition into your own words.	What are some words that have a similar meaning?
marvellous	
Use the word in a sentence.	What are some words that have an opposite meaning?

Odd One Out

7. Circle the word that you think is different and write down your reason for choosing that word.

lake forest ocean river

Reason: _____

happy joy excited grumpy

Reason: _____

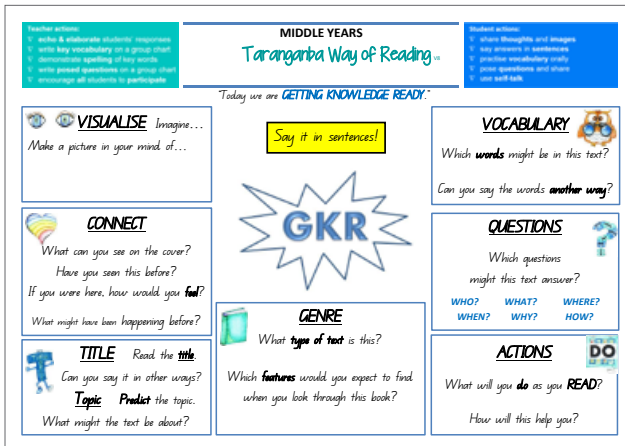
bus van bicycle car

Reason: _____

Resources such as these have been developed by Taranganba State School staff and are used widely to build consistency of practice.

The evidence so far

The impact of the Taranganba Way of Reading is impressive, but at its simplest Katrina explains it as this – “Our students love reading. They get to talk with an adult – read, unpack, and make connections. They are building a love of words”. Lauren adds “They absolutely love it. I’ve seen a growth in confidence. We have given the kids tools to use in other subject areas, and we can see them using new vocabulary in writing and speech.”



An example of a 'Getting Knowledge Ready' resource developed by the Taranganba State School staff.

The data supports this school's adoption of the Taranganba Way of Reading. In 2015 97% of students made a positive gain, with 60% of students at or above expected gain. There is an expected effect size of 0.8 but the Taranganba cohort effect size was 1.15, with 68% of students at or above expected effect size gain. In 2016, Year 3 NAPLAN Reading results show that they are comparable to the National Mean. 41.7% of the Year 3 students were in the upper two bands for reading, compared with 25% in 2015 (an increase of 16.7%). In Writing, 56% of the Year 3 students were in the upper two bands, compared to 41.3% in 2015. The TORCH assessment of Year 4 reading shows that there has been an increase of 23.8% of students in Stanines 8 and 9 (the top two levels), from 3.6% in Term 4 2015 to 27.4% in Term 4 2015.

“Our students love reading. They get to talk with an adult – read, unpack, and make connections. They are building a love of words.”

Teachers are reporting greater confidence in their knowledge of evidence-based teaching and learning practices, and their ability to apply this knowledge. Teachers feel students are engaged with reading and they enjoy an improved relationship with students, better behaviour through student engagement in learning and a growing love of reading.

“It’s around consistency, it’s around teamwork, it’s around teaching students how to think and how to learn.”

“We have learnt the value of consistency of practice, applying a scope and sequence to the whole school. This has been shaped by guided practice, literacy leaders modelling and demonstrating, peer observation and feedback and sharing of best practice. Our teacher aides have all come from our parent body. They are very skilled and have enriched this program enormously. They are skilling up other parents, by sharing the language and practices of this program. The meta-language is now widely embraced by our parent community, and this is having real benefits for our students” explains Katrina. Through this consistent approach we are able to celebrate the gains for every student.”

Aside from the commitment of time to work with John Munro, and the decision to direct teachers’ aide resources to reading, the school has largely worked within its existing resources, with considerable gains for the students. As Katrina says, “There’s no rocket science with what we’re doing. It’s around consistency, it’s around teamwork, it’s around teaching students how to think and how to learn.”

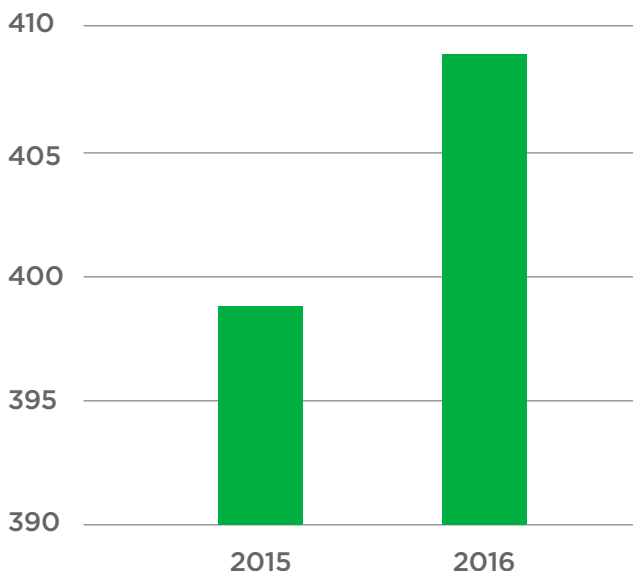


Tarangamba State School Data Snapshot

NAPLAN SUCCESSES

Year 3 Reading

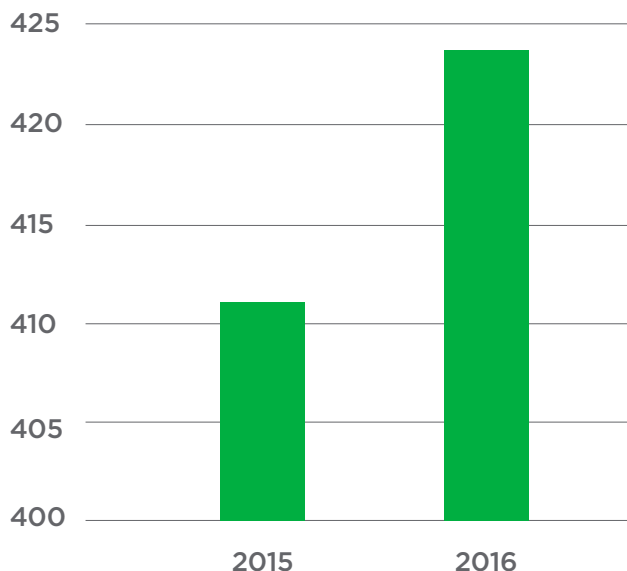
- 2016 we are comparable to the National Mean.
- 41.7% of our Year 3 students were in the Upper 2 Bands for reading in 2016, compared to 25% in 2015. That is an increase of 16.7%.



Year 3 Reading.

Year 3 Writing

- Results are comparable to the National Mean.
- 56% of our Year 3 students were in the Upper 2 Band for reading in 2016, compared to 41.3% in 2015. That is an increase of 14.7%.



Year 3 Writing.

Year 5 Reading

- We have maintained results that are comparable to the National Mean.
- Almost one-third of our Year 5 students were in the Upper 2 Bands for reading in 2016, which is comparable to 2015.

Year 5 Writing

- Our results we are comparable to the National Mean. We have maintained results from 2015.
- Almost one-quarter of our Year 5 students were in the Upper 2 Bands for reading in 2016, which is comparable to 2015.

Reading Assessment – TORCH – Year 4

Comparative TORCH Results				
Stanines	Term 4 2015		Term 4 2016	
1	18%	67.30%	1.90%	2.80%
2	10.80%		0.90%	
3	2.40%		5.30%	
4	25.30%		6.30%	
5	18%		12.70%	
6	16.80%		13.80%	
7	4.80%		31.70%	
8		3.60%	14.70%	27.40%
9	3.60%	12.70%		

TORCH results has shown significant improvement over the past 12 months.

- There has been an increase of 23.8% of students in Stanines 8 and 9 (Top 2).
- There has been a decrease of 26% of students in Stanines 1 and 2 (bottom 2).
- We now have 85.6% of our students in Year 4 at Stanine 5 and above, which is an increase of 14.7% from 2015.

Learn more

High Reliability Literacy Teaching Procedures

A/Prof John Munro,
www.findanexpert.unimelb.edu.au/display/person16425

Oral Language Supporting Early Literacy,
www.olsel.catholic.edu.au/literacy-resources/index.cfm?loadref=67

Hume Central Secondary College, High Reliability Literacy Procedures, year7fuse.weebly.com/uploads/1/4/9/5/14954694/hrhttp.pdf

Glenroy College (Victoria), Literacy Program.
www.glenroycollege.vic.edu.au/literacy-program/

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Watch the Taranganba Way of Reading at work at www.all-learning.org.au

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 - ^v Eunice Kennedy Shriver National Institute of Child Health and Human Development. (2000). *National Reading Panel*. Available at <https://www.nichd.nih.gov/research/supported/Pages/nrp.aspx>

MATHS SUCCESS AND JOY

at Bacchus Marsh College (Victoria, Australia)

“Far too many Australian students make too little learning progress each year. Many students who fall behind never catch up, while many highly able students are not stretched.”

Peter Goss, et al.ⁱ

What is the problem?

“We have students coming in at all levels of ability in Year 7 – from Grade 2 to Year 8 level” says Samantha Goodman, a Leading Maths Teacher at Bacchus Marsh College, a secondary school on the northern outskirts of Melbourne. “Overall, we were seeing students with low growth in maths and low engagement, and this was very concerning.”

The Foundation for Young Australians reports that 75% of future jobs will involve Science, Technology, Engineering and Maths (STEM), yet 42% of Australia’s 15-year-olds are not proficient in maths.ⁱⁱ The OECD reports that “Proficiency in mathematics is a strong predictor of positive outcomes for young adults, influencing their ability to participate in post-secondary education and their expected future earnings.”ⁱⁱⁱ

While there is a powerful imperative to lift the level of students’ mathematical skills the challenges confronting teachers in most maths classrooms can be daunting. The Grattan Institute noted in their recent report on targeted teaching, that “Despite heroic efforts by many teachers, our most advanced students are not adequately stretched while our least advanced are not properly supported. Many fall further behind over time.”^{iv} Samantha Goodman’s experience of the range of levels within one class is supported by the Grattan Institute’s findings: Grattan reports that there can be between five to eight levels within a single class.^v



“We found that our students can rote learn, but many students are not able to show understanding and problem solve,” reports Samantha Goodman. The challenge for the Year 7 Maths teachers at Bacchus Marsh College is to extend the knowledge and skills of every student regardless of their starting point.^{vi}

“75% of future jobs will involve Science, Technology, Engineering and Maths (STEM), yet 42% of Australia’s 15-year-olds are not proficient in maths.”



Targeted teaching, using accurate information about what students know and are ready to learn next, is known to have a significant impact on student learning and now forms one of the professional standards for teachers.^{vii} In practice, this could mean that in one class there are 25 students at 25 different points of readiness; so each of the 25 students needs to be learning something different. There are practical and pedagogical challenges with this model. For a single teacher “almost super-human ability” is required to maintain up-to-date data on the learning needs of each student, as well as organising and preparing differentiated learning materials, while also maintaining valuable direct instruction, student discourse and collaborative group-work.^{viii}

How does Maths Pathway help?

Maths Pathway is at the centre of a movement of teachers and schools who are overcoming the practical problems of differentiation. The Maths Pathway package includes tools, professional learning and consulting support allowing teachers to overcome the practical problems of differentiation. Teachers implement a learning model that enables a more targeted approach to teaching. The assessment cycle within that model is in five parts: set up and diagnosis; coursework; assessment; feedback; data and reporting.

Students need to be aware of their starting point, in order to set out on a path to reach their goals.^{ix} “New thinking about assessment is focusing on understanding where students are in their learning in order to identify appropriate starting points for action, and evaluate the effectiveness of such action” says Professor Geoff Masters, CEO of the Australian Council for Educational Research (ACER).^{xi} The Maths Pathway tool diagnoses where each student has gaps and competencies, within a subset of the curriculum, and then provides each student with targeted coursework for a two-week cycle. As Justin Matthys, founder of Maths Pathway, explains “we’re able to set work at the ‘Goldilocks zone of learning’: it’s not too hard, not too easy; it’s just right.”

“we’re able to set work at the ‘Goldilocks zone of learning’: it’s not too hard, not too easy; it’s just right.”

The learning activities are mainly hand-written tasks completed in exercise books. Students view questions and worked solutions on their computers, and participate in small-group mini-lessons to build key concepts. If students are stuck on their work, they can view a video for each activity or ask a friend for help – the computer recommends classmates to act as peer tutors, based on the strengths of other students in the class. Approximately 50% to 80% of class time is spent on individualised and small-group work, and the remainder is spent on hands-on learning, class discussion, and collaborative problem solving tasks designed by the teachers.^{xii}



At the end of each two-week cycle students are assessed. Each student's test is tailored to reflect the work they have been covering. The tests are not designed to expose failure, but are instead designed to track individual progress, as well as provide valuable information to teachers.

“We should praise the process, not students' intelligence ... and we should reward effort, strategy and progress if we want to see real growth in students.”

Once the tests are completed students and teachers reflect on results. Students review what work they have mastered and where they have made errors, followed by a brief meeting with their teacher to discuss progress. During these meetings, teachers emphasise soft-skills, attitudes and habits; and set learning goals with the student. As Hattie and Timperly note, feedback is most powerful when there is a learning context, and the feedback addresses a student's interpretation, not lack of understanding.^{xiii} The regular tests provide context and immediacy to the feedback each student receives.

The main metric in Maths Pathway is a student's growth rate. This focuses on how many activities a student demonstrated mastery of during a set period. If a student achieves one grade level of growth in one year, the growth rate is 100%. The growth metric is based on mastery of curriculum each fortnight.^{xiv} The other main metrics are accuracy (the proportion of work attempted that students master) and effort (the proportion of set work completed each fortnight).^{xv}

How is data useful?

“The most powerful determinants of student growth are the mindsets and learning strategies that students themselves bring to their work – how much they care about working hard and learning, how convinced they are that hard work leads to growth, and how capably they have built strategies to focus, organize, remember, and navigate challenges” contend Ron Berger, Leah Rugen and Libby Woodfin.^{xvi}

In her renowned work on mindsets, Carol Dweck argues that our abilities are not fixed and that every person is capable of growing and developing.^{xvii} Dweck found in research into maths achievement and students' mindsets that praising students for their intelligence, instead of the process (the effort or strategy), made students believe that their intelligence is fixed. Students who believed in fixed mindsets would avoid challenging tasks, and lose confidence and motivation when the task became hard. By contrast, students who had a growth mindset – who believe that they can improve – and whose process was praised, sought and thrived on challenges.^{xviii} “We should praise wisely”, says Carol Dweck. “We should praise the process, not students' intelligence^{xix} ... and we should reward effort, strategy and progress if we want to see real growth in students.”^{xx}

The growth, accuracy and effort data provided by Maths Pathway enables Samantha Goodman to bring students into the process of learning, so that they are active participants in their own learning.

“Students understand the data: they own the data. Students can articulate their understanding of their own growth” reports Samantha. “This means we can have conversations about the data and where it leads.”

Importantly, Samantha says that “the data is making the students more reflective learners.” Teachers are now able to use the fortnightly assessment data to have conversations with each student about their progression and learning skills. “Students have grown regardless of level. Where we’ve worked on soft skills those students have made the greatest growth.”

“The tests are not designed to expose failure, but are instead designed to track individual progress...”

“I’m doing more targeted teaching” reports Samantha Goodman. “I’m able to get to know the students better because of more targeted teaching and knowing what the barriers are.” Samantha uses the assessment data to identify small groups within each class who need explicit teaching on particular concepts or strategies. She is able to identify individuals who need to develop their learning strategies, and because she is doing less ‘chalk and talk’ teaching she has the time to focus on individuals. Working with individuals to chart the changes in the learning mindset is seeing a real change in their achievement.^{xxi}

How did Maths Pathway start at Bacchus Marsh College?

Bacchus Marsh College adopted Maths Pathway in 2015. Initially the school implemented a blended program for Year 7s and 8s, using a combination of a traditional textbook and Maths Pathway. From Term Three they used only the Maths Pathway program.

As Samantha Goodman reports, “Initially teachers hated the program. They found it very confronting. There is not much explicit teaching and you need to work on 25 individual programs.” Now, she says, “teachers love the data.” Teachers are able to use the data to identify issues and work with small groups more effectively.

The Year 7s at Bacchus Marsh College now spend three periods a week working on the individualised part of the Maths Pathway Learning Model, and two periods a week working collaboratively on rich problem solving using games, concrete materials and hands-on tasks designed by their teachers.

The evidence so far

Initially, Bacchus Marsh College had a mixed response to Maths Pathway from both the students and parents. After running information sessions and parent meetings, parents are now generally supportive of this new approach. As Samantha Goodman reports, it has been a case of constantly adjusting the program so that it works best for the students.

The data from Maths Pathway is bringing joy to learning. Samantha Goodman has seen a significant change in student growth levels. She says “students are staying back at lunchtime to get their data. They talk about which icon they’re on and there’s a real emphasis on a growth mentality.” Importantly, she reports that students are thinking about why their data is not as good as it could be and are reflecting on their learning behaviours.



As Berger et al. contend, developing a classroom culture in which students are constantly analysing data to improve is far more effective than sharing test results with students a few times a year.^{xxii} “Too often, in the name of protecting children’s self-esteem, we avoid explicit discussions of standards and where students stand in relation to them. Rather than boosting confidence, such ‘protection’ actually prevents students from advancing and blocks their understanding of what it takes to succeed... It moves conversations about progress from abstract, generic goals (eg., try harder, study more) to student-determined, targeted goals (eg., increase my reading level by 1.5 years...) and provides them with the skills to track these goals.”^{xxii}

“Schools which have used Maths Pathway are now seeing an average growth rate of 1.1 levels; and where the program has been most effectively implemented they are seeing an average of 1.8.”

Other schools which have adopted Maths Pathway are also seeing good results. Early research shows that 0.6 grade levels of learning per year occurred on average prior to using Maths Pathway. Schools which have used Math Pathway are now seeing an average growth rate of 1.1 levels; and where the program has been most effectively implemented they are seeing an average of 1.8. At one school 85% of students reported that they disliked maths as a subject at the start of a term; that number went down to 15% at the end of the term after using Maths Pathway.

By making the data their own, students at Bacchus Marsh College have been able to set specific learning goals and are seeing real results for their efforts. They are focussing on a new kind of data, which celebrates growth, effort and accuracy. Importantly, the students and teachers are able to engage in meaningful conversations about learning strategies which support the students as they tackle work which is set at the right level for them to learn and grow. They’re finding the ‘Goldilocks zone’ and a new kind of joy in learning maths.

Learn more

Maths Pathway

Visit: www.mathspathway.com for information about how to join this program.

Growth Mindset

View: What is mindset? mindsetonline.com

Watch: Carol Dweck, Developing a Growth Mindset - www.youtube.com/watch?v=hiiEeMN7vbQ

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Watch Maths Pathway at work at www.all-learning.org.au

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COLLABORATIVE PROBLEM SOLVING

at Eltham High School (Victoria, Australia)

Our schools need to prepare students for jobs that haven't been invented and technologies that don't yet exist. How can teachers prepare them? Along with core skills and knowledge employers are already demanding school-leavers who can collaborate and problem solve. These are essential skills for an information-rich economy which demands creativity, problem solving, collaboration and communication.

Collaborative Problem Solving: a skill for the 21st Century

Education researchers, policy makers and private enterprise agree that, in addition to content knowledge, students in the 21st century need to acquire particular skills to equip them for a modern world of work.

In 2015 the World Economic Forum said that "To thrive in a rapidly evolving, technology-mediated world, students must not only possess strong skills in areas such as language arts, mathematics and science, but they must also be adept at skills such as critical thinking, problem-solving, persistence, collaboration and curiosity."ⁱ

This is a real problem facing teachers today: how to teach skills to equip students for living and working in the 21st century. Research into the *Assessment and Teaching of 21st Century Skills* (ATC21S™)ⁱⁱ has grouped these skills into four categories: ways of thinking; ways of working; tools for working; and skills for living in the world.ⁱⁱⁱ

While teachers have many tools for assessing students' content knowledge they do not always have tools to assess skills such as collaborative problem solving. Collaborative problem solving has been identified by the Programme for International Student Assessment (PISA) as a key skill for the 21st century.

Patrick Griffin and Esther Care from The University of Melbourne's Assessment Research Centre, say that "Collaborative problem solving is a complex skill requiring both social and cognitive competencies. It was rationalised by the ATC21S™ project team as a composite skill arising from the links between critical thinking, problem solving, decision making and collaboration." Importantly, Collaborative Problem Solving is about combining the skills and knowledge of all team members to solve complex problems. It requires participation, perspective taking, social and task regulation, and knowledge building.^v

By working with real teachers and real students the ATC21S™ team have developed an assessment tool to provide real data to teachers and parents about students' collaborative problem solving skills.

How does ATC21S™ help?

Eltham High School is committed to teaching 21st century skills, including collaboration and problem solving. However, as Loren Clarke, Curriculum and Data Leader at the school found, although teachers were able to provide anecdotes and use observation, the school had no data to provide meaningful insights into students' skills in these areas and could not track student progress using objective measures.



“the emphasis is on skills over content and the development of 21st century dispositions from the start of high school.”

After approaching the ATC21S™ team at The University of Melbourne Loren began using the collaborative problem solving assessment tool in 2014. The Year 7 students at Eltham High School participate in a team-taught inquiry-based program which is an ideal environment for implementing the ATC21S™ assessment tool. Loren Clarke notes that “The Year 7 program is ideal as it focuses on group work skills and interdisciplinary learning: the emphasis is on skills over content and the development of 21st century dispositions from the start of high school.”

The assessment tool involves pairs of students working online to solve a problem. Each partner has different information on their screen and they need to communicate and share information in order to solve a problem. They communicate via a chat box and they may need to adjust their language and communication style so that they can work effectively as a pair. An example of one of the problems students have to solve is growing a plant: one student controls the temperature and the other controls the light conditions for the plant and they need to work together to make the plant grow.

Claire Scoular, Research Fellow at The University of Melbourne’s Assessment Research Centre, observes that it is complex for even the most experienced teachers to assess each student’s collaborative problem solving skills in a normal classroom situation. The benefit of the ATC21S™ tool is that it provides the teacher with baseline data for each student and help to inform ongoing teaching interventions.

How is data helpful?

Data from the assessment tool captures the sequences of actions and chat allowing observations to be made while students are working together online. The data for each student is summarised into a social and a cognitive report for each student and provides information such as who initiates conversations, whether students negotiate and whether they work through the problem systematically. Teachers are also provided with a report for the whole class, which provides guidance about how to cluster the class for future teaching. The data can also be analysed at a cohort level, so that teachers can see trends in the student population. As Loren Clarke reports, “we now know that most of our students enter the school with quite good skills already so are working from a solid base.”

Loren Clarke reports that students enjoy learning about how they think, as opposed to what they know. For some students Collaborative Problem Solving skills develop quite naturally but she believes that there are a range of students who benefit from explicit teaching of these skills.

For teachers at Eltham High School the ATC21S™ tool provides them with tangible data about their students' collaborative problem solving skills which enables teachers to plan teaching which addresses each student's needs. Students are tested at the start of Year 7, and then again at the end of Year 7, so that teachers are able to monitor progress. With individual reports, teachers are able to identify the Zone of Proximal Development for each student and plan how to embed teaching 21st century skills in to the curriculum. Loren Clarke reports that once the testing has been completed in Term One, teachers audit the collaborative and problem solving tasks that are already in their curriculum and adjust these based on the data. These tasks can include anything from: group work/conflict resolution sessions; having students undertake learning style and personal learning activities so that they understand their strengths/weaknesses in a group; using ICT tools to support collaboration (e.g. Google Drive); explicit teaching of problem solving and critical thinking (argument mapping, pro/con activities, logic and reasoning tasks), peer and self-evaluation in group work; small group dynamic activities that require students to solve small problems collaboratively (and mirror the types of open ended questions and problems encountered in other subjects e.g. maths, humanities, English, science).

The program has also been expanded to continue tracking student progress in Years 8-9, continuing the teaching and monitoring of students' collaborative problem solving into the later years of schooling.

The program consists of two tests in Year 7: one at the start of the year to establish a level for each student and one at the end of the year to assess growth. The students also complete a test at the end of Year 8 to 10, to track longitudinal growth.

The purpose of the testing across the four years is to track the development of the students' skills. The school now knows that they improve in Year 7 and tend to stop or slow down in Year 8, before beginning to pick back up in Years 9 and 10. In some cases there is a backward trend in Year 8 where students don't perform as well on the tests. The school is still working to understand this trend.

Loren Clarke is connecting this data to other student data, reporting "We have also worked to connect this data with students' literacy and numeracy ability, to see if there is a correlation, as well as some critical thinking data we have been collecting in Year 9."

What kind of joy exists when Collaborative Problem Solving is in place?

For Loren Clarke there is joy in "being able to see the effect we have as teachers; real evidence of learning. We can understand the impact we're having." She says that "there are often students who are strong in one area - so data is used to identify what should be taught, but also to review whether teaching has developed equal strength in both skills."

"being able to see the effect we have as teachers; real evidence of learning. We can understand the impact we're having."

Students report that working on the assessment tasks gives them insights into how they need to adjust their communication style for different situations and the need to share information and tasks with their partners. As they work on the assessment tasks students are also learning and gaining some insight into their own collaborative problem solving skills.

How did ATC21S start?

ATC21S™ began in 2009 as a research collaboration between The University of Melbourne, Intel, Cisco and Microsoft and governments in Australia, Finland, Singapore, United States of America, Costa Rica and the Netherlands. The project brought together academics, industry and policymakers to map out what they saw as the 21st century skills students need to develop to be prepared for the future of life and work.

The project then focussed on the key components of successful collaborative problem solving. ACT21S™ has developed and extensively tested a tool for the assessment of the complex skill of collaborative problem solving.

PISA, the OECD's Programme for International Student Assessment, drafted a new competency for inclusion in its 2015 assessment of students around the world. Students were assessed on their skills in Collaborative Problem Solving (CPS), which PISA defines as:

“Collaborative problem solving competency is the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution.”^{vi}

The evidence so far

The research behind the development of the tool was extensive, with academics across the globe involved in the process of defining 21st century skills. The tool represents the synthesis of a wealth of educational theory and practice in the area of collaborative problem solving.

Because it began as a research collaboration, the emphasis of ATC21S™ has always been on gathering data to analyse the efficacy of the tool and develop and improve it based upon that data.

The team has found that the test can be effectively applied globally and that there are common ways in which students solve problems, regardless of language or culture. The research team worked with real students and real teachers to develop an assessment and teaching tool for a real problem: teaching skills to equip students for living and working in the 21st Century.

Learn more

The ATC21S™ team has also developed five professional development modules for teachers who wish to adopt the ATC21S™ assessment tool in their own school.

Professor Patrick Griffin and Esther Care at The University of Melbourne run a free 5 week MOOC subject, *Assessment of Teaching and 21st Century Skills*. This course provides an in-depth understanding of 21st century skills and collaborative problem solving, what they are, how they are used, how to design problem solving activities and how to assess them. This is on the Coursera platform. www.coursera.org.

ATC21S™ You Tube channel - www.youtube.com/user/ATC21S

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Watch Collaborative Problem Solving at work at www.all-learning.org.au

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CREATIVE INQUIRY CYCLE:

Building critical skills at Rooty Hill High School (New South Wales, Australia)

“Education is a vision of what it is that our children will need if they are going to flourish in the world as we predict it will be: that is to say, in their world, not ours.

Guy Claxton and Bill Lucasⁱ


What is the problem?

“If we think a new idea will improve the learning trajectory for our students, we’re willing to take the risk” says Christine Cawsey AM, Principal of Rooty Hill High School in Sydney’s west. “We have a moral contract to help each student do their best.”

Rooty Hill HS is a co-educational school with over 1100 students. In 2016 over 50% of students were from non-English speaking backgrounds, while the Family Occupation and Education Index shows that 70% of students come from families whose educational qualifications and occupations are in the bottom 50%. On arrival at Rooty Hill HS, 60% to 80% of each Year 7 cohort is below grade average. Yet, Christine argues that “it’s not good enough” to accept that this will set a predetermined path for her students.

The school’s goal is for all graduates of the school to be effective employees, active global citizens and able to identify and build upon their own personal character strengths. Christine and her team of teachers have mapped a trajectory for each student which takes them from entry level – where they have many skills to learn – to developing the habits and dispositions which set each student up for work, study and life. Importantly, she has the data to show her students are growing and achieving, with 80% of Year 10s achieving many of the Australian Curriculum Assessment and Reporting Authority (ACARA) capability benchmarks.ⁱⁱ She acknowledges there is more to be done in Literacy and Numeracy.





Through deliberate and careful design the school has developed the Creative Inquiry Cycle, a model for project-, problem- and inquiry-learning. This model aims to develop student and teacher creativity capabilities and dispositions, so that each Rooty Hill HS graduate fulfils the school's goal for them.

“The school’s goal is for all graduates of the school to be effective employees, active global citizens and able to identify and build upon their own personal character strengths.”

This approach is in line with the school's strategic directions, focussing on a capability driven curriculum, underpinned by strong literacy and numeracy programs. The general capabilities are a key dimension of the Australian Curriculum, covering the knowledge, skills and dispositions that will enable students to thrive in the twenty-first century.ⁱⁱⁱ These capabilities derive from the 2008 *Melbourne Declaration on Educational Goals for Young Australians* which set the goal that all young people should become successful learners, confident and creative individuals, and active and informed citizens.^{iv}

How did the Creative Inquiry Cycle start at Rooty Hill High School?

Building on the goals of the *Melbourne Declaration*, Rooty Hill HS worked with Professor Bill Lucas to develop the Creativity Wheel.^v This built on a foundation thinking project to embed the Harvard Visible Thinking Routines, based on the work of Ron Ritchhart, Mark Church and Karin Morrison.^{vi} The school knew that the students were already strong in the areas of confidence and intercultural understanding. With an eye to the international focus on problem solving and creative thinking this seemed a sound approach.^{vii}

An important aspect of the Creative Inquiry Cycle framework is that students are asked to articulate and evaluate their own capabilities. As Christine explains, “we measure verbs” and by asking students to think about what they are doing we get a greater insight into what they understand, as well as their misconceptions. This is supported by Ron Ritchhart who says “When we demystify the thinking and learning process, we provide models for students of what it means to engage with ideas, to think, and to learn... School is no longer about the ‘quick right answer’ but the ongoing mental work of understanding new ideas and information.”^{viii}

“It was messy, there was confusion, there was trial, there was risk-taking,” Christine describes the process of developing the Creative Inquiry Cycle, which was led by the school's Human Society and Its Environment (HSIE) faculty who “had a spirit to change things.” The faculty faced many challenges: what would it look like? How would they bring together design-thinking, project- and inquiry-based learning, build a focus on the creative dispositions, and move from descriptions of behaviour to a teaching sequence and content, to conceptual links to drive curriculum?

“It was messy, there was confusion, there was trial, there was risk-taking”

The faculty tackled the challenge set by the Australian Curriculum to embed the capabilities into learning programs, without simply overlaying activities. The faculty developed illustrations of practice, with annotated lesson footage, exemplars and student work samples which have been key to helping teachers become familiar with the framework. This also allowed for review and refinement of the Creative Inquiry Cycle framework. Professional Learning sessions with the whole teaching staff have helped to build understanding, and the framework is now being tested by the Science and Mathematics faculties to develop STEM programs.

How is data useful?

Students at Rooty Hill HS have digital portfolios, to which they upload examples of their work, which they assess and map against the capabilities. The students' portfolios enable self-, peer- and teacher-assessment with early evidence pointing to greater capacity for student reflection and growing student confidence in individual capabilities.

Shae Dunbar uses the example of a Year 10 project to create a super park, with students working in teams as urban planners catering to the needs of their local community. The unit was designed using the Creative Inquiry Cycle with explicit focus on the creative dispositions of imagination, inquisitiveness, persistence, collaboration, and discipline. At each checkpoint in the project students could reflect, and peers and teachers could provide feedback. Teachers emphasised throughout the unit that creativity is not fixed, and found through survey data that students' perception of their own creativity grew by over 40% by the end of the unit. In particular, students recognised that they had developed the dispositions of persistence and inquisitiveness (being able to challenge assumptions, being able to wonder and question). As Shae explains, this is important because some students had a tendency to give up, and through self-reflection students understood that they could manage difficulty and uncertainty. "It's powerful for students to know that they can be all of these things when they leave school - these are essential skills to be a functioning adult" explains Shae.

Yasodai Selvakumaran, Humanities teacher at Rooty Hill HS, points to growing student engagement (feedback from student and staff surveys, attendance, and submission of assignments), higher order thinking evident in work samples, and improved collaboration which were outcomes of Year 10 Geography and Year 7 History units where the Creative Inquiry Cycle was used. Importantly, through self-assessment students were able to articulate how they were learning and thinking, a skill they can apply in the future.

The evidence so far

Rooty Hill HS is committed to making the Creative Inquiry Cycle framework part of its teaching and learning approach. As Christine notes, it was a risk for teachers to trial this framework, but the school has seen a real shift in what students can do. They are more collaborative, imaginative and curious, and greater engagement is resulting in improved learning.

The use of the Creative Inquiry Cycle framework is still in its infancy, but the qualitative and quantitative evidence is compelling, and shows real possibilities as the framework continues to be developed. The 2016 cohort of Year 10s were below average on literacy and numeracy measures when they arrived at Rooty Hill HS in Year 7. Forty percent of this cohort were below Grade 4 standard, in Year 7. By the end of 2016 over 70% of this cohort had reached state average on a key external measure, the NSW VALID science examination which assesses all the ACARA capabilities.





Students who participated in the Creative Inquiry Cycle based STEM project in 2016 showed improvements in their results. A comparison of Year 9 grade distributions across semesters one and two in 2016 showed that the majority of students improved their overall science grades by one grade, that is from 'C' to 'B' and 'A'. The cohort who moved from Year 7 to Year 8 in 2016 showed a 60% reduction in 'E' and 'D' grades, which teachers report as an outcome of the STEM project (using the CIC framework).

“through self-reflection students understood that they could manage difficulty and uncertainty”

Imagining better ways to prepare their students has required the school to apply discipline, persistence and imagination to its own ambitions. Christine compares the process to cooking: starting with a recipe and then improving on the recipe, and adapting it for each cohort of students and their particular needs. Reflecting on what the Creative Inquiry Cycle can offer her students, Christine affirms “If our students can deconstruct knowledge... [and they have the capabilities and skills], and if they can take control and own their own understanding, they can achieve anything.”

Learn more

Educating Ruby: What our children really need to learn

www.educatingruby.org

Claxton, G. and Lucas, B. (2015) *Educating Ruby: what our children really need to learn*. Crown House Publishing: Carmethen, Wales.

Visible thinking

Visible Thinking is a flexible and systematic research-based approach to integrating the development of students' thinking with content learning across subject matters. An extensive and adaptable collection of practices, Visible Thinking has a double goal: on the one hand, to cultivate students' thinking skills and dispositions, and, on the other, to deepen content learning.

www.visiblethinkingpz.org

Harvard's Project Zero: Visible Thinking - www.pz.harvard.edu/projects/visible-thinking

Ritchhart, R., Church, C., and Morrison, K. (2011) *Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners*. Jossey-Bass: San Francisco.

Rooty Hill High School

rootyhillhighschool.nsw.edu.au & telephone: +61 2 9625 8104

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Thanks

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Watch the Creative Inquiry Cycle at work at www.all-learning.org.au

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POSITIVE EDUCATION

using data to bring joy at Mount Barker High School (South Australia, Australia)

“Many Australian adolescents suffer from sleep deprivation, drug and alcohol abuse, insecurity, poor diets, insufficient exercise and family upheaval. According to the Australian Bureau of Statistics, one quarter of young Australians are suffering from symptoms of mental illness. Now more than ever, it is critical that we equip our young people with the skills and mindsets that counteract mental illness and prepare them for a ‘life well lived’.”

Professor Lea Waters, The University of Melbourne¹

What is the problem?

Warren Symonds, Principal at Mount Barker High School (South Australia, Australia), sees it as his role to care for the development of the whole student. He cares about the social and emotional wellbeing of his students, as well as their academic wellbeing. Mindful of the many challenges that confront young people, and statistics that suggest that as many as one quarter of all young people suffer symptoms of mental illness, Warren asked ‘how do we equip our students so that they flourish when they leave school?’

This is a complex question, and one which a growing body of research is beginning to address. The World Health Organisation (WHO) defines mental health as ‘a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community.’ Importantly, WHO recognises the resilience that is needed to cope with the stresses of life as well as the value of a fruitful life.

“how do we equip our students so that they flourish when they leave school?”

For Beyondblue, resilience is key to mental health and the organisation reports that “if you have a high degree of resilience you tend to be positive, productive and adaptable.” Resilience, along with the attributes of hope, gratitude, mindfulness, character strengths, growth mindsets, optimism and empathy, forms part of what is known as Positive Education. Increasingly schools are focussing on how they can equip students with positive skills to deal with adult life. In part this movement stems from the recognition that a positive approach to mental health has a longer-term benefit and can short-circuit a reactive approach to mental health issues.

Dr Martin Seligman leads this approach to mental health and he became part of South Australia’s Thinkers in Residence program in 2012. Seligman is an internationally recognised psychologist who specialises in the area of wellbeing and whose work underpins much of Positive Education in schools. Seligman’s sets this challenge: “As our ability to measure positive emotion, engagement, meaning, accomplishment, and positive relations improves we can ask with rigor how many people in a nation, in a city, or in a corporation are flourishing. We ask with rigor when in her lifetime an individual is flourishing. We ask with rigor if a charity is increasing the flourishing of its beneficiaries. We can ask with rigor if our school systems are helping our children flourish.”



The Positive Psychology movement is a network of research-based scientists based at over 50 universities across the world, including Harvard, University of Pennsylvania, Princeton, The University of Melbourne, University of Sydney, Monash and Cambridge.

Positive Education, the application of this approach within schools, is being adopted by a growing numbers of schools in Australia. The Positive Education Schools Association (PESA) recognises the benefits of collaborating and sharing knowledge in this relatively new area.

How is Positive Education implemented at Mount Barker?

Warren Symonds believes that the best way for Positive Education to be a success at Mount Barker is for the philosophy to be embedded into the curriculum and teaching practice. He believes that the most effective approach is to build resilience and well-being by living and teaching a practice that demonstrates how Positive Psychology can permeate every aspect of a student's life. His vision is that 'students don't even know they're doing it'.

“the best way for Positive Education to be a success at Mount Barker is for the philosophy to be embedded into the curriculum and teaching practice.”

As Warren reports, Positive Education is now embedded into the DNA of the school. In Year 10 English classes Positive Education character strengths are used as a framework for writing a character analysis. In Year 9 Science the science behind growth mindsets is taught. Importantly, Warren and his team map out how Positive Education is being taught across the curriculum to ensure that there is no doubling up across the curriculum.

The *live it, teach it, embed it* approach encompasses not just student learning but also how teachers engage with students. Mount Barker teachers were trained by the University of Pennsylvania's Resiliency Training, as well as attending training at Geelong Grammar School – a leader in the Positive Education movement. The proverb about needing a village to raise a child underpins Mount Barker's commitment to sharing Positive Education knowledge and skills with primary schools, council, local service providers and families. Warren is keen that the school develop a model that can be widely shared and understood, to improve the lives of young people across South Australia.

Mount Barker students report that initially they found this approach challenging. They would ask “how does this connect with what we’re doing at school?” They were challenged by being self-reflective, but now feel that they have the tools to take a more positive approach.

How is data helpful?

“We want to make certain that our students are leaving school in a better frame of mind” states Warren Symonds. This certainty is underpinned by data collected through Mount Barker’s wellbeing measurement tool. As Warren argues, “we’ve got to measure first and then learn.”

“we’ve got to measure first and then learn”

Mount Barker has adopted the Middle-years Development Index (MDI) which is administered by South Australia’s Department for Education and Child Development once a year. This measurement tool measures a number of aspects of wellbeing, such as connectedness. Students are asked to report on factors such as what they do in and out of school, how much television they watch, how much sport they play. This measurement tool provides Mount Barker with information about each student, mapped against Positive Education attributes. In the example of connectedness, Mount Barker teachers were able to identify that many students experienced a gap in connectedness with a significant adult. The school looked at ways to increase student voice, leadership and ownership within the school, including: training student leaders in the Appreciative Inquiry process;

handing over the running of school assemblies to students; and inviting every fifth student on the school roll to be involved in reviewing and rewriting the school’s student behaviour management policy. In doing this students were invited to come up with the behaviours they believed staff and students needed to exhibit to create a positive learning environment. These then became the basis for a code of behaviour for staff and students that is publicised throughout the school. Anecdotally students have reported that since undertaking positive education training staff members are more approachable and seem more interested in them as people. Since implementing these initiatives the school’s data saw a 61.8% increase in students who believe they have a connection with adults in the school.

Comprehensive survey data is analysed by DECD and presented to teachers in a report. Jenni Cook, Assistant Principal in charge of Positive Education and Student Wellbeing, reports that areas of concern and areas of growth are analysed. These are discussed as part of the staff Positive Education Training and Development Program, with time allowed for learning area teams to discuss ways to address identified concerns through the positive education program, through specific targeted interventions or through curriculum areas (usually through a mix of the above).

A report about the whole student cohort is shared with staff who then plan how to integrate Positive Education in to their own teaching program. As Warren reports, this is a process of constantly revising and constantly questioning. It is a process of putting the prism of Positive Education over an Art and English unit, for example, which jointly share the theme of ‘optimism’. Data from the Complete Mental Health Map, a second tool used by the school,





enables staff to determine which areas need work, so that they can focus on 'persistence', for example, with a particular year group. Jenni Cook explains, "...in year 8 the school implemented a different approach to Physical Education, with greater focus on general fitness and less on 'sport' to target an identified drop-off in physical activity in Year 9. The school now incorporates a unit on 'It's not all about me' in Year 9 Positive Education to address a need identified around 'appropriate relationships'."

Encouragingly, within 18 months of implementing the Positive Education program Mount Barker saw a 7% improvement in reported wellbeing in every area. Students have responded well to the program and report growth in the positive culture of the school.

How did Positive Education start at Mount Barker?

Mount Barker began the Positive Education program in 2012, after being invited by South Australia's Department of Education to work with Martin Seligman, Thinker in Residence. Inspired by Seligman's book *Flourish*, Warren worked with his senior staff to devise a Positive Education program for Mount Barker, and a model that could be shared across the Mount Barker community. The school sees this as important: so that students at its feeder primary schools are introduced to Positive Education; so that those who surround each student are supportive of the school's ethos.

"Positive psychology is not a spectator sport"

Jenni Cook sees tangible benefits for staff in adopting a Positive Education approach. "Positive psychology is not a spectator sport" she says. Jenni reports that learning about Positive Education has encouraged teachers to look at themselves and their own wellbeing. Staff have developed practices around keeping gratitude journals, mindfulness, and appreciating others which have improved their own wellbeing. Significantly, Jenni found that Mount Barker staff wellbeing surveys showed a 16% increase in the number of staff who were flourishing from baseline data in 2012 to the staff survey in 2013, after a year of Positive Psychology training and development for staff. The implementation of Positive Education has opened the door to increased collaboration and sharing between staff as the school develops its programs for year levels and curriculum areas and shares its Positive Education learning.

The evidence so far

Data from the wellbeing measurement tool adopted at Mount Barker shows a 7% improvement in the wellbeing of students moving from Year 8 to Year 9.

Research into Positive Education is still in its infancy, but there are promising early signs about the effectiveness of these programs to improve student wellbeing. Some research shows that improving student wellbeing improves academic performance and reduces school absences, as well as decreasing stress and anxiety, while increasing self-efficacy, self-esteem and optimism. In 2009 Sin and Lyubomirsky conducted a meta-analysis of 51 Positive Psychology Interventions (PPIs) and found that PPIs do significantly increase wellbeing. However, most of the research in this area has been conducted using adults and more research is needed on the effectiveness of Positive Psychology programs with adolescents.

Learn more

SenseAbility

A strengths-based resilience program designed for those working with young Australians aged 12-18 years. It consists of a suite of modules developed to enhance and maintain emotional and psychological resilience.

Visit: www.beyondblue.org.au

MindMatters

MindMatters is a mental health initiative for secondary schools that aims to improve the mental health and wellbeing of young people. We call it a 'framework', in that it provides structure, guidance and support while enabling schools to build their own mental health strategy to suit their unique circumstances. MindMatters provides school staff with blended professional learning that includes online resources, face-to-face events, webinars and support. Visit: www.mindmatters.edu.au

Watch: What do you see in the classroom?

www.youtube.com/watch?v=D17y1F_X7Vc

Positive Education Schools Association:

www.pesa.edu.au

Martin Seligman and Adelaide Thinkers in Residence:

www.thinkers.sa.gov.au

A useful guide to research and practice in Positive Education is also at www.thinkers.sa.gov.au/thinkers/martinseligman/find.aspx

Geelong Grammar School:

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CREATING ACTIVE LEARNERS:

Visible Learning and Seesaw at Hilltop Road Public School (New South Wales, Australia)

“My goal is to learn all my multiplication by the end of the year. When you aim for something, and you get there, it makes you feel proud.”

Emma, student at Hilltop Road Public School

What is the problem?

When staff at Hilltop Road Public School looked at student learning they found that “our students could tell us what they did, but they couldn’t tell us the learning behind it.” As Cheryl Romer, Assistant Principal, explains, she could set a task which a student could complete accurately, but she would not have any evidence that the student really understood the topic.

Hilltop Road Public School is in Western Sydney. The school has approximately 750 students, with about 60% of the school population from culturally and linguistic diverse backgrounds. The school is in one of the most diverse parts of Sydney, with a low socio-economic profile and students from over 74 cultural backgrounds.

The school was concerned that students were not able to clearly discuss what they had learnt and how they had learnt it. Also concerning for staff, they found that students could not articulate how they could improve or extend their learning. The skill of articulating the process of learning and the capacity to reflect are essential to the development of independent self-regulated learners, which is a central goal for the school.ⁱ

As Principal Natalie See explains, the teaching staff asked themselves “how do we mobilise our students and community to be really active in their learning?”



How did Visible Learning using Seesaw start?

The school began an action research project looking at how students articulated their learning, drawing on John Hattie's work around *Visible Learning*.ⁱⁱ As Hattie explains:

“Visible teaching and learning occurs when learning is the explicit and transparent goal, when it is appropriately challenging, and when the teacher and the student both (in their various ways) seek to ascertain whether and to what degree the challenging goal is attained... The remarkable feature of the evidence is that the greatest effects on student learning occur when teachers become learners of their own teaching, and when students become their own teachers. When students become their own teachers, they exhibit the self-regulatory attributes that seem most desirable for learners (self-monitoring, self-evaluation, self-assessment, self-teaching).”ⁱⁱⁱ

The staff at Hilltop Road PS knew that they needed to connect their students with their learning and that they needed to build student engagement with learning. The school also wanted to engage the whole school in community learning and build strong learning partnerships between the school, families and the wider community.

“how do we mobilise our students and community to be really active in their learning?”

In 2015 Hilltop Road Public School began to use Seesaw, a digital portfolio which enables families to see and comment on their children's work. Parents can comment on their children's work in their own language, and they provide an authentic audience for their children. Seesaw also enables teachers to track and assess student work, as well as communicate effectively with parents.

The digital tool provides a window into the school's approach to Visible Learning. Visible Learning involves the use of learning intentions and success criteria (LISC), which are appropriately challenging articulations of goals which are explicitly known by the student.^{iv} “The aim of making learning visible to students is to empower them to take ownership of their learning, through self-reflection and the articulation of what and how they are learning” explains Natalie See.

Hilltop Road PS initially trialled the use of Seesaw in Kindergarten to Grade 2, but soon found that parents with children in the older grades were requesting that the program be rolled out across the school.

“It's a game-changer, it's like opening up the walls of the classroom. A lot of people are a bit scared of bringing parents in to the classroom... and our parents loved it.”

The school offered workshops for parents about how to have conversations about student work; teaching parents the language of Visible Learning, learning intentions and success criteria. As Hattie explains, strategies like this, which engage parents in the language and practice of schools, result in enhanced engagement by students in schooling, improvements in reading achievement, greater skills for the parents, and higher expectations and satisfaction with the school.^v

Cheryl Romer reports “It's a game-changer, it's like opening up the walls of the classroom. A lot of people are a bit scared of bringing parents in to the classroom... and our parents loved it.”



How does Visible Learning and Seesaw help?

Each student at Hilltop Road PS sets their own learning goals and through Visible Learning strategies becomes a critic of their own work. Students are asked to consider “what challenged you during this learning experience?” and consider this before they load examples of their work to Seesaw. As an articulation of learning “It lets the children show you what they know. And because it’s going to a different audience they’re either showing you their best work or they’re having to define what it is they’re learning about” explains Cheryl Romer.

The school has worked hard to develop its Time to Talk (Triple T) Project so that teachers can meet with every student and discuss each student’s digital portfolio. Carefully structured questions, an informal approach, and photo evidence of work helps to build powerful insights into how students are learning and in-depth knowledge of each student. At these meetings students use Seesaw to reflect back on work they found hard, or a challenge, and to discuss what they have discovered about themselves as learners.

Seesaw is a way for students to show evidence that they are meeting success criteria. As a means of empowering the students to become their own teachers, Seesaw enables students to reflect on their own learning, articulate what and how they are learning with the appropriate language, and be more independent in their learning.

As Robert, a student at Hilltop Road PS, describes: “If I didn’t have Seesaw my mum would ask me ‘what did you do today?’ and I’ll say ‘umm, I went to school’, and I wouldn’t remember. I can talk to my mum even more about school, because I can remember and it’s more fun.”

For Cheryl Romer Seesaw opens the dialogue with parents and creates a three-way conversation, which evolves during the course of the school year. A benefit for her is that at Parent-Teacher meetings there are no surprises, as parents have already had opportunities to engage with evidence of their child’s learning. One of the Hilltop Road PS parents, Akenata Vunivalu, explains “I can tell my children that I’m learning too. Seesaw is the best way to learn because it involves us and we can see what is going on in the school and what the children are learning about. So it goes both ways: the child is learning and we are learning as parents.”

For a school with such a culturally and linguistically diverse population, Seesaw has opened up communication between school and home. “When people come from other cultural backgrounds a picture makes a great impact on them and tells more stories than just a pen to paper” reports Akenata. It makes it much easier for parents from non-English speaking backgrounds to engage with what their children are learning.

How is data useful?

The introduction of Visible Learning strategies, in conjunction with the use of Seesaw as a digital portfolio, has given teachers at Hilltop Road PS a powerful insight into their own impact on student learning. The data gained from Seesaw enables teachers to capture student learning, and use that data to plan next steps, and to differentiate the challenges for individual students. Cheryl Romer says “You get a really strong overview of where the kids are. Seesaw helps to identify the kids who could slip under the radar, those who haven’t completed work, or those who need some support.”

Importantly, the school uses Seesaw to gain insights into each student's articulation of learning. Cheryl Romer uses the example of teaching angles and trajectory, using the game Angry Birds. Students draw the angles and trajectories needed to gain high scores in the game, and then add a verbal annotation to the task when they load it up to Seesaw. "As a teacher I could set a worksheet on angles and they could get it all right on the worksheet. But if I ask them to do a real task on angles, then I hear whether they've got it by their annotation over the top."

Teachers collect examples of student work stored on Seesaw when planning, and then analyse work to determine growth in each student's knowledge, skills and capabilities at the end of each unit of learning. The student work on Seesaw can be sorted in a variety of ways, enabling teachers to track progress and identify next steps for teaching.^{vi}

The evidence so far

Hilltop Road PS has tracked their impact on student learning through their action research project and have found that the introduction of Visible Learning strategies and the use of Seesaw have had positive results.

Cheryl Romer reports that as a result of the changes in practice 82% of students interviewed were better able to articulate what they are learning and why they are learning it. Teachers' use of learning intentions and success criteria has helped students to articulate not only what they are learning, but the things they need to do to reach their goals.^{vii}

Visible learning has enabled teachers to identify, address and monitor student learning needs more specifically, as they are now focusing explicitly on learning intentions and success criteria. Through the action research project staff were able to compare student work developed using learning intentions, and work developed without this strategy. Teachers found that the student work developed using learning intentions was of a better quality. Cheryl Romer explains, "in writing work samples where LISC (learning intentions and success criteria) practices were used, the meaning in the text was clearer and contained more language features that were relevant to the text type. Work reflected the focus of the learning and students used a success criterion to self-assess their work and identify key focus areas to work towards."^{viii}

"Through analysing the evidence set we are also able to determine that teachers and students are now having meaningful conversations about whether the student has achieved the intended focus of the lesson. Teachers have demonstrated they are able to use students' assessment data to understand the learning needs of students and plan follow up lessons accordingly" reports Natalie See.

"82% of students interviewed were better able to articulate what they are learning and why they are learning it."

The introduction of Seesaw has seen an improvement in communication between school and home, and extensive parent engagement with learning. Natalie See says "all families want to share the success of their children and this is a great way for that to happen." The evidence supports her observation: by October 2016 up to 1,000 items of student work had been loaded on to Seesaw per week. Almost 660 parents were connected with the program, with parent visits to the site reaching over 2,000 per week. Weekly comments from parents reached a high of 625 individual comments, and 3,530 individual likes.

Reflecting on what she has learnt since implementing Visible Learning practices and Seesaw, Cheryl Romer says "I've learnt that parents truly want to be partners in their children's education. They don't want the tokenistic 'bake five cakes and stand on the cake stall'. They really want to be involved... I've learnt that the dialogue between you and the parents is much better, because the parents don't see you as a threat."

Through changes in practice, the adoption of evidence-based strategies, and the engagement of parents in learning, Hilltop Road PS has seen real improvements in student learning. The school has gained greater knowledge of each student as a learner, and each student is making gains in their own abilities to self-assess, to reflect and to set and reach goals for learning.

Seesaw Data Snapshot

Week of	New items	Likes	Comments	Parent visits
Jul 24 - Jul 31	1,736	2,023	367	1,555
Jul 31 - Aug 7	1,418	1,601	357	1,709
Aug 7 - Aug 14	1,849	2,117	573	1,893
Aug 14 - Aug 21	1,886	2,929	452	1,764
Aug 28 - Sep 4	2,344	3,463	451	2,072
Sep 4 - Sep 11	2,237	2,932	439	1,874
Sep 11 - Sep 18	1,653	1,310	329	1,630
Sep 18 - Sep 25	986	918	188	1,519

Learn more

Visible Learning: John Hattie:

www.visible-learning.org

Professor John Hattie has been Director of the Melbourne Educational Research Institute at the University of Melbourne, Australia, since March 2011. Before, he was Project Director of asTTle and Professor of Education at the University of Auckland, New Zealand. His research interests include performance indicators, models of measurement and evaluation of teaching and learning. John Hattie became known to a wider public with his two books *Visible Learning* and *Visible Learning for teachers*. Visible Learning is a synthesis of more than 800 meta-studies covering more than 80 million students. According to John Hattie Visible Learning is the result of 15 years of research about what works best for learning in schools.

More information about Seesaw:

web.Seesaw.me/Seesaw-for-schools-hilltop-road

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Watch *Creating Active Learners at work* at www.all-learning.org.au

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AUSTRALIAN LEARNING LECTURE

The Australian Learning Lecture (ALL) is a joint project of State Library Victoria and the Koshland Innovation Fund. Commencing in 2015, the decade-long project is designed to strengthen the importance of learning in Australia for all Australians. It is not politically or commercially aligned.

ALL is structured around a biennial lecture that brings to national attention a new, big idea in learning and compelling reasons for new approaches to learning. The lecture is followed by a two-year impact program to showcase how the idea proposed in the lecture can be translated into practice and to create awareness of the need for a learning culture in Australia.

OUR IMPACT PROGRAM

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The video of Sir Michael Barber's Lecture, *Joy and Data*, and case study videos of six exemplar schools showing how they use data and diagnostic tools are available at www.all-learning.org.au.

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